Summary of Collection 5 Changes in the MODIS Snow and Sea Ice Algorithms and Products

General

A naming convention for the SDS names was adopted and applied across all the products. Some of the SDS names have been changed in V005.

A local attribute named "Key" is included with every SDS. Key describes the meaning of values in the SDS. Values are ordered from lowest to highest in the key.

A thematic quality assessment (QA) approach was taken. QA data is stored as integer values in V005 as compared to the bit encoded scheme used in V004. Reason for the change was to allow the QA data to be easily accessible by a user.

Internal HDF data compression has been implemented in all the algorithms except for the swath level products which are compressed after production. The data compression is invisible to users as HDF capable software tools automatically decompress the data.

New in Collection 5 is the monthly, global snow product for both Terra and Aqua.

MOD10_L2 | MYD10_L2

A fractional snow cover map is generated in Collection 5. The fractional snow map is based on the regression technique of Salomonson and Appel (2004) and is calculated for both Terra and Aqua. Fractional snow, 0-100% is calculated for land and inland water bodies i.e. snow-covered water bodies, not obstructed by cloud and over the NDSI range of 1-100. Fractional snow may be mapped where the snow map shows no snow because it is not bounded by the same NDSI limits as is the snow map algorithm. The reason for that is to allow fractional snow mapping over the whole NDSI range indicative of snow.

Limits to snow detection based on estimated surface temperature are applied to both the snow map and fractional snow results to reduce the occurrence of erroneous snow cover on bright, warm surfaces. If a surface has an estimated temperature > 283 K then it cannot be snow.

In order to reduce the occurrence of erroneous snow detection in low illumination conditions a shadowed land screen is implemented. This screen checks the difference in reflectance of MODIS band4 – band6. The difference must be greater than 20 for a pixel to be mapped as snow and the NDSI must be < 0.40. This screen is applied to both the snow map and fractional snow results to reduce errors of commission in low illumination conditions. The screen has been effective at reducing erroneous snow in summer conditions on vegetated land in cloud shadow. In conditions such as dense vegetation with thin or

sparse snow cover where the snow spectral signal is weak the screen may remove what could be visually interpreted as snow.

SDSs in the product:
Latitude
Longitude
Snow_Cover
Snow_Cover_Pixel_QA
Fractional_Snow_Cover

New global attributes:
Shadowed_Land_Screen_Threshold
HDFEOS_FractionalOffset_Along_swath_lines_500m_MOD_Swath_Snow
HDFEOS_FractionalOffset_Cross_swath_pixels_500m_MOD_Swath_Snow

Salomonson VV, Appel I. 2004. Estimating fractional snow cover from MODIS using the normalized difference snow index (NDSI). *Remote Sensing of Environment* 89: 351–360.

MOD10A1 | MYD10A1

A fractional snow cover map is mapped into the daily snow cover product using the same scoring selection algorithm as used to produce the snow cover map from the MOD10_L2 data. The daily fractional snow cover map is new in Collection 5.

SDSs in the product:
Snow_Cover_Daily_Tile
Snow_Spatial_QA
Snow_Albedo_Daily_Tile
Fractional_Snow_Cover

MOD10C1 | MYD10C1

No major changes were made for Collection 5.

MOD10A2 | MYD10A2

No major changes were made for Collection 5.

MOD10C2 | MYD10C2

No major changes were made for Collection 5.

MOD10CM | MYD10CM

The monthly, global MODIS snow product is new in Collection 5. The MOD10CM is in the geographic climate modeling grid (CMG) projection at about 5 km spatial resolution. Monthly average snow cover is calculated from the daily

global products (MOD10C1) for the month. Average snow cover (0-100%) is calculated from days that are mostly clear; the confidence index must be > 70 for a day to be used. Infrequent occurrences of snow are filtered from the calculation. At least 85% of the days for a month must be available for the product to be generated. A global map of average snow cover for a month is the output.

SDSs in the product:
Snow_Cover_Monthly_CMG
Snow_Spatial_QA

MOD29 | MYD29

The SDSs of "Sea Ice by IST" and "Combined Sea Ice" were deleted from this product for Collection 5.

SDSs in the product:
Latitude
Longitude
Sea_Ice_by_Reflectance
Sea_Ice_by_Reflectance_Pixel_QA
Ice_Surface_Temperature
Ice_Surface_Temperature_Pixel_QA

MOD29P1D | MYD29P1D

The SDSs of "Sea_Ice_by_Ice_Surface_Temperature" and "Combined_Sea_Ice" were deleted from this product for Collection 5.

SDSs in the product:
Latitude
Longitude
Sea_Ice_by_Reflectance
Sea_Ice_by_Reflectance_Pixel_QA
Ice_Surface_Temperature
Ice_Surface_Temperature_Pixel_QA

MOD29P1N | MYD29P1N

The SDS of "Sea_Ice_by_Ice_Surface_Temperature" was deleted from this product for Collection 5.

SDSs in the product:
Ice_Surface_Temperature
Ice_Surface_Temperature_Pixel_QA

MOD29E1D | MYD29E1D

No major changes were made for Collection 5.